

MEMORANDUM FOR RECORD

SUBJECT: 11th Meeting of the Regional Navigation Design Team, 6-8 December 1999

1. The subject meeting was held at the Panama Canal Commission's (PCC) Canal Capacity Projects Office, Panama City, Panama. The meeting agenda and list of attendees are enclosed (Encl. 1 and 2). All Regional Navigation Design Team (RNDT) members were represented except for the Pittsburgh District. Special guests were in attendance from HQUSACE, Messrs. Bruce Riley and Dan Casapulla, CECW-ET, who serve as the HQ proponent for Navigation R&D; and CERL, Dr. Ashok Kumar, who has been conducting collaborative research with the PCC. Attendance by these key guests provided the RNDT with input across all corporate levels from HQ to the field. Sincere and heartfelt thanks to Mr. John Gribar and the staff at the Canal Capacity Projects Office for hosting the meeting and taking great care of the RNDT while in Panama. We received exceptional hospitality and participated in extremely interesting tours and discussions, focusing on the one of the greatest engineering achievements in the 20th Century, The Panama Canal.

2. After opening remarks and introductions by the RNDT and guests, Mr. Gribar introduced members of his staff and provided a preliminary overview of the Canal Capacity Projects Office. The Projects Office is staffed with 20 personnel and reports directly to the PCC Administrator's Office. They are responsible for leading and directing the canal construction modernization program (approx. \$1B over the next 10 years) primarily through the use of AE Contracts. The canal system has miter gates that are 85 years old and have never been replaced. Each gate leaf weighs 480 tons. Over 835,000 ships have passed through the canal since the initial lockage. All concrete is in very good condition because of the absence of freeze-thaw cycles.

3. The group reviewed the status of the tasks from our previous meeting in May 1999 held in Pittsburgh. The tasks and status are:

a. Continue the A/E Initiative: The RNDT discussed the importance for having regionally based contracts and how efficiencies are gained not only in the administration but in the area of cost effectiveness. There was much discussion on the occurrence of A/E's obtaining and using designs and data from various districts to fulfill contract obligations with other districts. Occurrences such as these should be identified and addressed up front during the preparation of the scope of work. Contract negotiations should address work to be obtained from others and the final negotiated contract should reflect a price considering the use of "site adapt" design data. PCC provided an interesting viewpoint in how to resolve such concerns by actually placing

personnel into the AE's offices for a period of time during critical stages of design e.g. at start-up. Their representatives are actually paid by the PCC under contract administration costs. This can also be accomplished in the form of a team of technical experts and could be rotated through the AE offices at various stages of design. As a result of this effort by PCC, they have enhanced communication and minimized design losses. ACTION: (Moussa) Remains open, more information needed to develop a summary of work distribution to WES, CERL's R&D efforts.

b. Designate an Operations Member: Need replacement for the Operations representative and discuss the regional concept with HQ. ACTION: (Simpson) Remains open.

c. Check on the Sign Guidance with HQ and Finalize: Mr. Bruce Riley, HQUSACE, provided a status update and indicated that HQ will be issuing a memo that re-caps the following information:

(1) The following crucial dates remain valid: 1 Jan 01 - Safety-Critical Signs; 1 Jan 03 - (if site specific deferral of the 1 Jan 01 date has been received, reviewed, and approved by HQUSACE before 1 Jan 01); 1 Jan 06 - for all other Waterway signs.

(2) Project Sign Plan must be prepared!

(3) EP 310-1-6a, the Sign Manual, is a guide for sign placement and, as such, other alternatives may be available that could reduce the cost of safety-critical signs in the following locations (based upon highest to lowest priority of their criticality):

- Upstream from non-gated, fixed crest dams
- Downstream from dam gates (in draw-in area within the downstream-restricted zone)
- All other safety-critical signage areas

(4) Discussion of the alternatives to the suggested safety-critical signs shown in the Sign Manual along with feedback on the results of a meeting scheduled with the U.S. Coast Guard HQ to discuss Corps use of some of the USCG markers and Aids to Navigation in lieu of large, very expensive signs illustrated in the Corps' manual. Use of USCG Aids to Navigation is in compliance with the Sign Manual. But, we may be proposing to use some of the USCG markers in a way that the USCG hasn't used them to date. The bottom line: The signage developed for each project must be in concert and compliance with the sign manual or, if there is an incident and a court case over that incident, the district and project may be out on their own with no real defense.

Mr. Riley closed with a recommendation for all to consider developing options in order to avoid the highly expensive signs. ACTION: HQUSACE/Riley to prepare memorandum to field with above-stated information.

d. Draft Letter in Support of the WES Model Proposal and Lead Ad Hoc Group: The latest scope of work, dated 2 Dec 99, outlining WES' effort on the filling and emptying system for the general model facility. Mr. Fallon provided the overall status of the model effort and the proposed testing effort. Mr. McClellan provided a very insightful and detailed discussion of the technical aspects of the model study effort. ACTION: Continue Ad Hoc Group effort with WES and report to RNDT with status.

e. Coordinate WES Model Proposal with HQUSACE: The Ad Hoc Group chairman, Mr. Fallon, discussed the follow-up approval needed from HQUSACE/Mr. Earl Eiker in order to continue with the model study efforts. Mr. Fallon believed this action had already occurred and would look further into the resolution of any open-ended actions.

f. Consideration of how to build awareness within the construction industry for upcoming navigation plans: ACTION: Mr. Simpson, LRD, to coordinate with Construction and Office of Counsel personnel in order to have a industry representative visit LRD to discuss upcoming navigation plans.

g. General: Mr. Hughey, MVS, solicited a discussion on issues related to having a consultant AE serving on an advisory board for a specific design effort and the potential to "disqualify" the AE from open competition. It was generally thought by all this would require OC and CT guidance during initial planning of how the work is to be accomplished. Perceptions are very important and giving wrong ones must be avoided. Mr. Gribar commented that we must be cognizant of "over-developing" any one particular AE, i.e. ensure that work is spread around so that we essentially broaden the AE/industry knowledge base. Need USACE commitment to foster expertise development throughout the AE community.

4. Update on Innovations:

a. Detroit District - Mr. Joe Kubinski provided an excellent update on what Detroit District is doing regarding the work at the Soo Locks where they are planning to replace the Davis Lock with a lock structure similar to the adjacent Poe Lock. Shipping on the Great Lakes utilizes tows with sizes that range from 105' to 1000' long. 1200' chambers will be needed for the future. Consideration will be given to the design of non-standard approaches, which is typical in the Sault Ste. Marie System. Butterfly valves with through the sill filling and emptying system will be basis for the design. The new lock will operate under a lift of 24' and will have a double set of miter gates. Joe also noted that locks on the Great Lakes are closed approximately four months every year.

b. Louisville District - Mr. Byron McClellan provided an update on the great work Louisville District is planning to do at J.T.Myers. Plans and specifications are in production for the Olmsted Dam. Float-in technology will be utilized as a result of siting a casting yard

approximately 10 miles away in Paducah, KY. RNDT Members should consider the possibility of re-using such a facility for future navigation work that is being planned.

5. Cost Savings from Innovations - Mr. Fallon reminded all RNDT members to continue to account for and document cost savings associated with implementing innovative designs. The team will review a cost summary of savings in future RNDT meetings.

6. Panama Canal Capacity Projects Office Briefings: various members of the PCC provided the following briefings.

a. Re-Engineering of the Locks Maintenance Function - A Results-Oriented Approach by Mr. Ivan Lasso, Superintendent, Pacific Branch, Locks Division: Maintenance can be classified three ways: Improvement; Preventive; Corrective. There are many problems associated with the traditional preventive-maintenance system: no sense of ownership; majority of inspections done in rotating shifts; large backlog of pending reported jobs; discrete inspections - no overall check of equipment; equipment taken out of service separately by mechanics and electricians; fixed-time system; and standard times for inspections. Establishing a results-oriented maintenance philosophy results in the realization that maintenance is an investment, not a cost. It increases production/operations, equipment efficiency, and quality. It reduces production losses. Finally, it promotes being in control of the plant. Implementing a results-oriented approach achieves a circle of control based on a productivity cycle of continuous improvement. Results of implementing such an approach has had a significant increase in equipment reliability, reduction of delays and service calls, radical changes of maintenance processes, organization, and culture within the PCC's area of operation.

b. Locks Control Systems by Mr. Carlos Patterson: Mr. Patterson discussed the Locks Machinery Conversion and Control Systems Upgrade (LMCCS) program, which is an effort to improve operations safety, reliability, and reduce costs in operations and maintenance of the Panama Canal. LMCCS integrates the conversion of operations machinery using direct connected hydraulic cylinders and the upgrade of the control systems of miter gates, and filling valves, using programmable logic controllers (PLC). LMCCS will provide the capability of real time diagnostics and predictive maintenance for the lock operating machinery. During Mr. Patterson's presentation, Dr. Ashok Kumar (CEERD-CF-M) pointed out to the RNDT committee that CERL was conducting collaborative research with the PCC in this area that was funded under the "Innovations for Navigation Projects Research Program (INP)". A proof of concept demonstration of real time machinery diagnostics and the predictive maintenance is planned for the Wilson and Barkley Locks (Nashville District).

c. Planning a Waterway of the Future by John Gribar: The Canal Capacity Projects Office was established in March 1998 to look at the long-term future of the canal, find additional water sources, explore options for Canal capacity increases, and prepare a master plan. The needs for a master plan were many: 1) Water availability and storage in the Canal watershed are insufficient

to sustain the existing system; 2) Current operating system cannot support full capacity, and therefore cannot support a Canal expansion; 3) Forecasts project increases in Canal traffic and an even greater increase in the amount of cargo over the next 50 years; 4) With the trend to build larger ships, the percentage of the world shipping fleet that is unable to transit the Canal is constantly increasing; 5) To meet the demand for potable water for communities adjacent to the Canal; 6) To meet current system capacity; 7) To permit locks maintenance with growing traffic; 8) No planned changes in locks size, ship draft, or Canal operating procedures. The Master Plan for the Future will: 1) Be a time-phased program of progressive individual project implementation to gradually increase Canal capacity; 2) Be based on customer input for the level and type of services required in the future; and 3) Be inherently flexible to allow adaptation to changes in traffic demand. The Master Plan will address such initiatives as: 1) Developing a forecast system for long-term traffic demand; 2) Evaluating new sources of water for increased water supply and increased storage in the watershed; 3) Studying locks water-saving systems; 4) Improving current Canal efficiency; 5) Developing new locks and alternatives for lifting/lowering ships; 6) Improving navigational channels; 7) Developing marine support infrastructure for Canal operations; 8) Performing social and environmental impact studies; 9) Evaluating economic analysis and financing alternatives.

d. Water Pressure Measurement in the Locks Chambers by Juan Wong: The objectives of this study were to: 1) Measure actual pressures exerted by vessels transiting inside the locks chambers; 2) Define the structural design parameters for future shiplift water chambers; 3) Determine vessel effects to evaluate reliability of existing structures and operating modes. This work was contracted through the Mobile District via an Interagency Service Support Agreement with Pittsburgh District because of their recent experience using pressure transducers to measure and solve water surface fluctuations caused by filling and emptying operations at Emsworth Locks. The conclusions from this study revealed: 1) Pressures are mainly hydrostatic, correlated to water surface level. Minor turbulence from vessel propellers was observed. 2) Large ships entering lock chambers pushed water, created a surcharge up to 2.35 feet. Faster moving vessels caused larger surcharges than slower vessels. 3) Northbound vessels caused smaller surcharges, up to 1.22 feet. 4) Exiting vessels created a suction drawdown behind them, up to 1.44 feet. 5) Moving vessels across miter gate sills caused a velocity drawdown of 3.93 feet, due to restricted area for water to rush past vessel sides and bottom. 6) A modified blockage ratio that takes water area surrounding vessel and of culverts into account was representative of water level effects. Several recommendations were addressed: 1) Vessels entering shiplifts at a maximum blockage ratio of 0.88 should travel at a maximum speed of 1 knot; 2) Canal Capacity Projects Office will begin capacity studies to correlate lockage entry/exit times with vessel blockage ratio, type, speed, size, and number of locomotives.

e. Ship Lift Alternatives Studies by Juan Wong: Mr. Wong provided a briefing on the history of ship lift equipment/machinery from the end of the 19th Century to the present. Shiplifts save water but consume energy. There are basically two types: Dry transfer or wet transfer of which many examples in use today were described and depicted.

f. Enhanced Vessel Traffic Management System and Communication, Traffic, and Navigation by Henry Stec: Mr. Stec provided two briefings and tour of the vessel control facility which is similar in how it operates to an air traffic control tower.

g. Tours: Mr. Gribar and his staff provided excellent, in-depth tours of the Miraflores and Gatun Locks Facilities, the Dredging Division facilities in Gamboa, and the Industrial Division at Gatun Locks.

7. Conclusions:

a. Mr. Bruce Riley (CECW-ET) mentioned to the RNDT members that MG Hans Van Winkle (CECW-ZA), during his visit to CEMVD, presented the predictive maintenance and remote structural monitoring as examples of leveraging technology to reduce costs. St. Louis and Louisville Districts are already doing similar work, and there is a need to develop a new follow on research program in this area. Mr. Bruce Riley remarked during the RNDT meeting closing comments that the Districts should consider adding Predictive Maintenance and Structural Monitoring capabilities to their project submittals i.e. that now is the time to pursue such initiatives.

b. Issues to be presented at the next or actions to be resolved before the next RNDT meeting:

1) RNDT letter to HQUSACE requesting approval of model testing effort (ACTION: FALLON)

2) Status of Operations member and status of construction industry's perspective of upcoming navigation plans (ACTION: SIMPSON)

3) Formalized review/summary of projected cost savings as a result of ongoing innovative initiatives (ACTION: ALL)

4) Presentation of the micro-modeling effort on the upper Mississippi River (ACTION: LUNDBERG)

c. This meeting proved to be very informative and interesting as many ideas were contributed and shared with all. Learning firsthand of the innovative ideas that the Canal Capacity Projects Office are pursuing fostered much discussion that provided mutual benefits to their personnel as well the RNDT members. Pictorial documentation of the RNDT's trip to the Panama Canal may be seen at <http://www.cecer.army.mil/conmat/>

CELRH-EC-D

3 January 2000

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8. The next meeting of the RNDT was tentatively scheduled for the week of the 15 May 00 in Rock Island, IL. A final determination of when and where will be made at a future date.

Enclosures

[ENCL1](#)

[ENCL2](#)

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